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ABSTRACT

Focusing on the acquisition of semantic features and the relation between semantic and perceptual features, this study further tests the "semantic feature hypothesis," where a child acquires full adult word meaning component by component, and its complementary "correlation hypothesis," which claims that the source of these semantic features lies in underlying perceptual events. Dimensional adjectives were chosen because they can be defined in terms of perceptual features, such as height and length, which are amenable to experimental control. Forty children were administered four tasks at weekly intervals, and the results revealed a six-stage model of development in each child's pattern of response to "big," "little," and "long." The "semantic feature hypothesis" is systematically evaluated against the data, and it is concluded that those aspects of the hypothesis pertaining to the acquisition of semantic features are supported, but that aspects pertaining to the organization of features within semantic space need expanding to account for what happens with semantic space once a new feature is acquired and that linguistic development appears to be more than just a reflection of corresponding cognitive development. (EJS)

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THE ACQUISITION OF DIMENSIONAL ADJECTIVES AS A FUNCTION OF THE UNDERLYING PERCEPTUAL EVENT[1]

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It has been long known that when young children first begin to use words, they frequently use them in novel ways. The initial observations of misused words were observations of errors in the child's production (Bar-Adon and Leopold, 1971). Systematic investigation of both the young child's production and comprehension has revealed this incorrect use of words in both realms (Donaldson and Balfour, 1968; Donaldson and Wales, 1970; E. Clark, 1971, 1972; Eilers, Oller and Ellington, 1974; Palermo, 1973, 1974). In both comprehension and production, across a wide range of semantic domains, the meanings young children give to words frequently differ from the adult meanings; yet, the two meanings, child and adult, are always related.

The most thorough accounting of this wrong, but not all wrong, use of words is the 'Semantic Feature Hypothesis' (E. Clark, 1973). Noting that child meaning differs from, but is related to, adult meaning, the Hypothesis posits that the young child does not know the full adult meaning, but only part of it. The child comes to acquire the full adult meaning, component by component, semantic feature by semantic feature. The complementary 'Correlation Hypothesis' (H. Clark, 1973) claims that the source of these semantic features lies in the underlying perceptual events. The Hypothesis posits that the semantic features internal to language are related to perceptual features which are external to language. While both Hypotheses have received general support, there are aspects of the model generated by these two complementary Hypotheses which have not received total support. Furthermore, there are aspects yet to be tested. The theoretical issues in this research focus on two areas: 1) the acquisition of semantic features and, 2) the relation between semantic and perceptual features.

Dimensional adjectives were selected for further study because they are defined, for the adult anyway, in terms of perceptual features such as height and length, features which are amenable to experimental control.

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In addition, the interpretation of many of the previous results is ambiguous due to some methodological oversights. The first concerns the lack of analysis based on individual differences. Much of the previous work on dimensional adjectives has been analyzed in terms of group differences. This type analysis can mask both individual differences and/or universal stages. The second methodological problem concerns the stimuli frequently used. In much of the previous research on dimensional adjectives the stimulus pairs had changes in more than one feature, and it could not be ascertained which feature the child was actually using. For example, squares have been often used to assess 'big'. A big square has more Area and more Extension than a little square. When the child chooses the big square it cannot be determined which feature, Area or Extension, the child is using. The third issue also concerns the stimuli used in many of the previous studies. Changes in semantic features were frequently confounded with changes in perceptual features. For example, squares frequently have been used to assess 'big' and 'little' and rectangles to assess 'long' and 'short'. Any differences between the responses to 'big' and 'long' could be due to either the differences in the semantic features of 'big' and 'long' or to the differences in the perceptual features of the two stimulus pairs.

Lumsden and Poteat (1968) found that six-year-olds defined 'big' in terms of Vertical Extension, as if 'big' meant the adult 'tall'. Maratsos (1973) extended this work to younger children and reported that children aged 4;6 to 6;6 defined 'big' in terms of Vertical Extension, but that three-year-olds did not. The present study is a further extension of this work to both younger and older children as well as to other dimensional adjectives, to 'long' and 'little'. Four specific questions were asked:

1. What features are tagged to 'big', 'long' and 'little' across ages?
2. Is there a pattern of acquisition over and above any observed individual differences?
3. Is there a correlation between the features used in semantic and perceptual spaces?
4. Is the observed shift in 'big' paralleled by a similar shift in non-linguistic space?

PROCEDURE

Forty children with no known physical nor mental handicaps were seen. The children ranged in age from 2;4 to 7;9. At least one girl and one boy were seen in each three month age interval beginning at age 2;3. One girl and one boy both aged 2;0 were seen, but they would not attend to the task.

There were four tasks, one administered per visit at weekly intervals. The non-labeled task (described below) was the first task for all children. The assessments of 'big' and 'long' were counterbalanced across visits two and three. 'Little' was always assessed on visit four.

Figure 1 shows the stimuli used on all tasks. The training pairs consisted of one stimulus which had more Area and more Extension, but in the test pair, one stimulus had more Area and the other one had more Extension.

STIMULI USED ON ALL TASKS

TRAINING TEST

Figure 1

In the non-labeled task, a counterbalanced sequence of pairs of training stimuli, including a transposition task, was presented. With the presentation of each pair, the experimenter said, "Give me the one that gets the candy." The correct choice was the bigger stimulus, and it was rewarded. To an incorrect response, the experimenter said, "no, that's not the one that gets the candy. Let's try another one." Once the criterion of five correct responses out of six trials was met the test pair was presented and either response was rewarded. Two additional training pairs were then presneted followed by a second presentation of the test pair. If the child picked the square on both test items, it was assumed s/he was using the feature Area. If s/he picked the rectangle both times, it was assumed s/he was using Extension. If both responses did not agree, two additional test series were obtained. If the child picked the square three out of four times, it was assumed s/he was using Area. If s/he picked the rectangle three out of four times, it was assumed s/he was using Extension. If the responses to the test pairs consisted of two squares and two rectangles, the child was labeled as <u>In Transition</u>. The child's pattern of response to the entire test series was the basic unit of analysis.

The assessments of 'big' and 'long' were identical to the non-labeled task except for the accompanying verbalizations. In the assessment of 'big' the experimenter said, "Give me the big one." In the assessment of 'long', the experimenter said, "Give me the long one." The assessment of 'little' differed from the non-labeled task in two ways. The experimenter said, "Give me the little one", and rewarded a response of the little stimulus on the training trials. As on all tasks, either choice was rewarded on the test trials.

RESULTS

<u>Acquisition of 'big', 'long' and 'little'</u>

Figure 2 shows the percent correct (in terms of Area) responses to 'big'. The two-year-olds respond correctly significantly more often than the three- to five-year-olds (Fisher Exact Probability Test p=.02). Figure 3 shows the percent correct (in terms of Extension) responses to 'long'. The three- to eight-year-olds responded correctly more often than the two-year-olds, but the difference was not significant (Fisher Exact Probability Test p = .10). The decrease in correct responses to 'big'

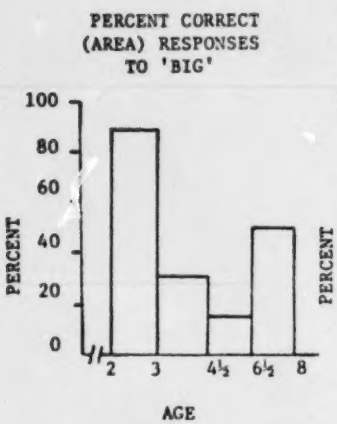

Figure 2

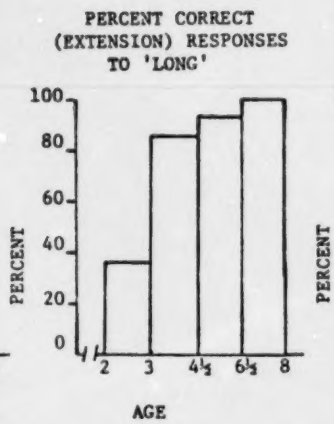

Figure 3

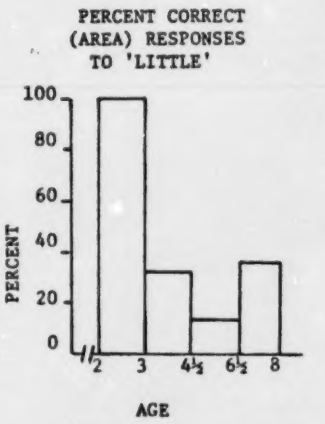

Figure 4

and the increase in correct responses to 'long' are both due to the shift in the use of criterial features from Area to Extension. Figure 4 shows the percent correct responses to 'little'. Note the similarity between the responses to 'big' and 'little' as a function of age. Not only does the definition of 'big' shift from 'in terms of Area' to 'in terms of Extension' but so does the definition of 'little' (Fisher Exact Probability Test $p=.002$). As the correct use of 'long' increases, both 'big' and 'little' decrease in accuracy. And it is not until much later, around age 7;0, that 'big' and 'little' are once again used correctly.

'Big' and 'long' were counterbalanced as first word assessed. The percent correct responses to 'big' did not differ significantly as a function of first word assessed (Fisher Exact Probability Test $p > .10$), nor did the percent correct responses to 'long' (Fisher Exact Probability Test $p > .10$).

Boys tended to use Extension on any or all three words at an earlier age than girls, but the difference was not significant (Kolmogorov - Smirnov Test $p > .10$).

Lumsden and Poteat (1968) reported that adults respond to 'big' in terms of Area. While the two-year-old's pattern of response appeared to be like the adult's, a closer analysis revealed it was not. The two-year-olds responded to the initial training trials exactly like the older children; they immediately met criterion. But after presentation of the first test item, the two-year-olds began to make errors on the training pairs. It was as if they had been responding to some global property of the stimulus, to the 'whole', and when the 'whole' was broken up, as in the test item, they no longer had a basis for response. The six youngest children made at least one such error, and three of them made more than three such errors. Furthermore, the two children who were just 2;0 made so many errors of this type that their assessments were terminated before completion.

Six-Stage Model of Development

When one looks at each child's pattern of response to all three words a six-stage pattern evidencing the increasing influence of Extension and reflecting individual differences emerges. Table 1 gives the number of

TABLE 1

NUMBER OF CHILDREN IN EACH STAGE OF DEVELOPMENT BY AGE

STAGE	AGE 2;4-2;11	3;0-4;5	4;6-6;5	6;6-7;9	Total
1. 'big', 'long' and 'little' in terms of Area	5				5
2. 1 word only in terms of Extension	2	3	1		6
3. 2 words in terms of Extension	1	4	1		6
4. all 3 words in terms of Extension		5	9	3	17
5. either 'big' or 'little' shifts back to Area			1	3	4
6. both 'big' and 'little' shift back to Area				2	2
Total	8	12	12	6	40

children in each stage of development by age. In Stage 1, children define all three words, 'big', 'long' and 'little', in terms of Area. Stage 2 children define two words in terms of Area and one word in terms of Extension, and there are individual differences as to which word is first defined in terms of Extension. Some children first define 'big' in terms of Extension, others first define 'long', and for some children 'little' is the first to be so defined. In Stage 3, children define two words, one of which must be 'long', in terms of Extension. By Stage 4, all three words are defined in terms of Extension. In Stage 5, 'long' remains defined in terms of Extension, and either 'big' or 'little' shifts back to Area. And in Stage 6, 'long' still remains defined in terms of Extension, and both 'big' and 'little' shift back to Area.

Relation between Semantic and Perceptual Features

Figure 5 shows the percent responses to the non-labeled task based on Area. Seventy percent of the children responded to the non-labeled task in terms of Area, and the responses did not vary across ages (Fisher Exact Probability Test $p > .10$). Recall the increasing influence of Extension in semantic space as a function of age; no such influence is

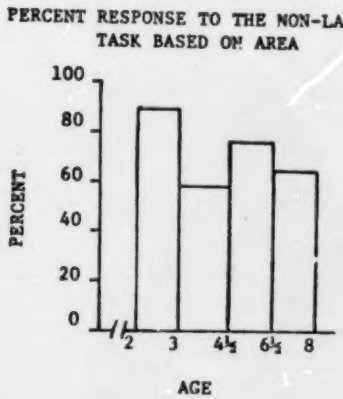

Figure 5

evidenced on the non-labeled task. Table 2 gives the number of children who used the same feature in semantic space (on at least one word) and on the non-labeled task. Note that while Stage 4 children defined all three words in terms of Extension, over half of them responded to the non-labeled task in terms of Area. Furthermore, the disparity between the features used on 'big' and the non-labeled task is even greater; fourteen children responded to the two tasks differently. Obviously, the observed shift in the definition of 'big' is not paralleled by a similar shift in

TABLE 2

NUMBER OF CHILDREN USING THE SAME FEATURE
IN SEMANTIC SPACE AND ON THE NON-LABELED TASK

	Feature Used in Semantic Space		
Feature Used on Non-Labeled Task	Stage 1 only Area	Stage 4 only Extension	Total
Area	5	10	15
Extension	0	7	7
Total	5	17	22

non-linguistic space. The observed shift in 'big' appears to be either related to much earlier (prior to age 2;6) perceptual-cognitive development or is a purely linguistic phenomenon.

DISCUSSION

The data show a consistent six-stage pattern of development of the meanings of 'big', 'long' and 'little'. The problem becomes how best to account for this pattern of development. The most thorough model yet put forth to account for the acquisition of word meaning is the Semantic Feature Hypothesis; how well does it account for the present data? Let's examine the Hypothesis point by point.

1. The Semantic Feature Hypothesis posits that when a child first begins to use a word he does not know the full adult meaning. This aspect of the Hypothesis receives support; the two-year-old's response is not the same as the adult's.

2. The Hypothesis further posits that child meaning is but a part of the full adult meaning, that the child's set of features is a subset of the adult's. The present data contradict this aspect of the Hypothesis. The Stage 4 child defines 'big' in terms of Extension; the Stage 4 child's set of features for 'big' is not a subset of the adult's.

3. That aspect of the Hypothesis that claims the child acquires meaning component by component is supported by the observed six-stage sequence of development. I argue that the two-year-olds respond not in terms of Area, but in terms of some global feature, some 'whole'. Extension is the next feature to be acquired, and Area is acquired much later.

4. The data show that the order of acquisition of semantic features is universal as predicted by the Semantic Feature Hypothesis. The six-stage sequence shows two-year-olds use some global feature, four-year-olds use Extension, and seven-year-olds use Area. The observed individual differences are not differences in the order of acquisition of semantic features; rather, they are differences in the use of the features once acquired.

5. The data also show that this universal order of acquisition of semantic features is from the general to the specific, first a very general feature, perhaps analogous to Size, then the more specific feature Extension in one dimension only followed by the more restrictive feature Area, the coordination of Extension in the vertical dimension with Extension in the horizontal dimension.

6. The Hypothesis predicts that the order of acquisition of hierarchically related words is from the general to the specific. More precisely, the Hypothesis predicts that the meaning of the more general word is acquired before the meaning of the more specific word. For example, the specific word 'doggie' is learned before the more general word 'animal', but initially 'doggie' is used to mean the adult 'animal'. It is the meaning of the more general word that is first learned. In the case of dimensional adjectives, the hypothesis predicts 'big' (the meaning of 'big') should be acquired before 'long; (the meaning of 'long'). The data contradict this aspect of the Hypothesis. They show that the first adult word meaning to be acquired is the adult 'long'.

Those aspects of the Semantic Feature Hypothesis pertaining to the acquisition of semantic features are supported. However, those aspects pertaining to the organization of features <u>within</u> semantic space are not. The Hypothesis builds on the notion that the initial non-differentiation of 'big' and 'long' is due to a <u>lack</u> of semantic features needed to differentiate them. This appears to be quite true. Stage 1 children have two words, 'big' and 'long', but one concept, based on some global property. A tacit assumption of the model is that when a second feature enters semantic space it will bring with it (or initiate the development of) an additional concept. But the present data show this not to be the case; Stage 4 children, having acquired the feature Extension, still have but one concept, albeit a new concept, but not an additional concept.

The Correlation Hypothesis posits that the structure of perceptual space will be preserved in semantic space. While it is true that children use perceptual features as semantic features, they do not use the same features on both a verbal and a similar non-verbal task. The shift in the definition of 'big' appears to be a purely linguistic phenomenon. It appears that once children acquire a new semantic feature, they 'play around' with it; they do not immediately use it in the adult manner.

In conclusion, the general thesis of the Semantic Feature Hypothesis focussing on the acquisition of the features is supported. However, those aspects of the model pertaining to the organization within semantic space need strengthening, particularly in light of the finding that the observed shift in 'big' is not due to a dominance of Extension at the perceptual-cognitive level. The model does not need to be revised so

much as it needs to be expanded. It needs to broaden its scope to account for what happens within semantic space once a feature is acquired, to account for the finding that new features bring new concepts but not necessarily additional concepts, that linguistic development appears to be more than just a reflection of corresponding cognitive development.

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